

**What is Claimed:**

- 1           1.       In an absorption cooling system of the type which uses a refrigerant  
2       and an absorbent and which includes a high stage generator, absorber, condenser,  
3       heat exchangers, and an evaporator and means for connecting said components to  
4       one another to form a closed absorption cooling system with said solution side of  
5       said high stage generator being fluidically divided into two sections with a partition  
6       plate whereby gas exiting one section at relatively high temperature is further cooled  
7       in the second section which functions as a flue gas recuperator (FGR) to improve  
8       overall burner efficiency.
- 1           2.       The system of claim 1 in which the entire solution leaving the  
2       absorber is passed through the FGR.
- 1           3.       The system of claim 1 in which a fraction of the solution leaving the  
2       absorber is passed through the FGR.
- 1           4.       The system of claim 1 in which the stream of weak solution leaving  
2       H2 is split with a fraction of said solution being heated in the FGR.
- 1           5.       The system of claim 1 in which part of the solution entering G2 is  
2       bypassed to the FGR.
- 1           6.       In an absorption cooling system of the type which uses a refrigerant  
2       and a lithium bromide absorbent and which includes a high stage generator,  
3       absorber, condenser, high and low temperature heat exchangers, and an evaporator  
4       and means of connecting said components to one another to form a closed  
5       absorption cooling system with said solution side of said high stage generator being  
6       fluidically divided into at least two sections with at least one partition plate whereby  
7       gas exiting one section at relatively high temperature is further cooled in the second

8 section which functions as a flue gas recuperator (FGR) to improve overall burner  
9 efficiency.

1 7. The system in claim 1 in which the said FGR recovers about 20-40%  
2 of the waste heat available in the flue gas.

1 8. The system in claim 1 in which the said FGR recovers about 30% of  
2 waste heat available in the flue gas.

1 9. The system in claim 1 in which all of the weak solution that is  
2 circulated in the absorption cycle is passed through a FGR before entering in low  
3 temperature heat exchanger to exchange heat with exhaust gas leaving high stage  
4 generator section to eliminate the danger of crystallization of strong solution in the  
5 low temperature heat exchanger.

1 10. The system in claim 1 in which a fraction of weak solution that is  
2 circulated in the absorption cycle is passed through the FGR to exchange heat with  
3 exhaust gas leaving the high stage generator section.

1 11. The system of claim 10 in which solution leaving the FGR is mixed  
2 with heated weak solution leaving the high temperature heat exchanger.

1 12. The system of claim 11 in which the fraction of solution passing  
2 through the FGR is such that temperature of solution leaving FGR is +/-10 degree C  
3 when compared to temperature of heated weak solution leaving the high temperature  
4 exchanger.

1 13. The system of claim 10 in which solution leaving the FGR is mixed  
2 with heated weak solution leaving the low temperature heat exchanger.

1           14.     The system of claim 13 in which the fraction of solution passing  
2 through the FGR is such that the temperature of solution leaving the FGR is +/-5  
3 degree C when compared to temperature of heated weak solution leaving low  
4 temperature heat exchanger.

1           15.     The system in claim 12 in which the fraction of solution flow entering  
2 the FGR is determined by use of an orifice.

1           16.     The system in claim 12 in which the fraction of solution flow entering  
2 the FGR is determined by use of a mechanical valve.

1           17.     The system in claim 12 in which the fraction of solution flow entering  
2 the FGR is determined by use of an electronically controlled valve.

1           18.     The system in claim 14 in which the fraction of solution flow entering  
2 the FGR is determined by use of a mechanical valve.

1           19.     The system in claim 14 in which the fraction of solution flow entering  
2 the FGR is determined by use of a mechanical valve.

1           20.     The system in claim 14 in which the fraction of solution flow entering  
2 the FGR is determined by use of an electronically controlled valve.

1           21.     In an absorption cooling system of the type which uses a refrigerant  
2 and an absorbent and which includes a high stage generator, absorber, condenser,  
3 high and low temperature heat exchangers, and an evaporator and means for  
4 connecting said components to one another to form a closed absorption cooling  
5 system with said solution side of said high stage generator being fluidically divided  
6 into two sections with a partition plate whereby gas exiting one section at relatively

7 high temperature is further cooled in the second section which functions as a flue gas  
8 recuperator (FGR) to improve overall burner efficiency.

1 22. The system in claim 21 in which a fraction of the stream of the weak  
2 solution leaving the low temperature heat exchanger is passed through the FGR to  
3 exchange heat with exhaust gas leaving the high stage generator section.

1 23. The system in claim 21 in which the fraction of solution passing  
2 through the FGR is such that the temperature of the solution leaving the FGR is +/-5  
3 degree C when compared to the temperature of the heated weak solution leaving the  
4 high temperature heat exchanger.

1 24. The system in claim 21 in which a fraction of the solution entering  
2 the low stage generator is bypassed to exchange heat in the FGR to produce  
3 refrigerant vapor.

1 25. The system in claim 24 in which the fraction of the solution entering  
2 FGR is such that concentration of solution leaving FGR is equal to concentration of  
3 solution leaving low stage generator.

1 26. The system in claim 24 in which the fraction of solution entering the  
2 FGR is such that the absorbent concentration of solution leaving the FGR is within  
3 +/-0.5 percent absolute when compared to the absorbent concentration of solution  
4 leaving the low stage generator.

1 27. The system in claim 24 in which the vapor portion of the FGR and  
2 vapor portion of the low stage generator are fluidically connected to operate at a  
3 pressure difference not exceeding 0.2 torr.

1           28.    The system in claim 21 in which weak solution entering the high  
2   temperature heat exchanger is heated with the FGR.

1           29.    The system in claim 28 in which solution entering the FGR is the  
2   entire weak solution leaving the low temperature heat exchanger.

1           30.    The system in claim 21 in which the said absorbent is lithium  
2   bromide and the said refrigerant is water.

1           31.    The system in claim 21 in which said solution side of said high stage  
2   generator is fluidically divided into more than two sections with partition plates  
3   between each connecting section, whereby gas exiting one section at a relatively  
4   high temperature is further cooled in said subsequent sections (FGR) to improve  
5   overall burner efficiency.

1           32.    The system in claim 21 in which the said two sections are connected  
2   to the said partition plate with a weld joint.

1           33.    The system in claim 21 in which the said two sections are connected  
2   to the said partition plate with a removable flange connection.

1           34.    The system in claim 21 in which the effectiveness of the said heat  
2   exchangers is between about 80% and 95%.

1           35.    The system in claim 34 in which the preferred effectiveness of said  
2   heat exchangers at full load operating condition is about 85%.

1           36.    The system in claim 34 in which preferred effectiveness of the said  
2   heat exchangers at full load operating condition is about 95%.